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O'Brien, Gerard Joseph; Opie, Jonathan Philip.
Internalizing communication, *Behavioral and Brain Sciences*, 2002; 25 (6):694-695.

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10th December 2010

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involve cross-domain integration of persons, objects, actions, space, and time, and there is good evidence that such representations provide conceptual input to early language (Tomasello 1992). Delayed imitation in later infancy is based on event representations and provides a prelinguistic social-experiential semi-symbolic cognitive representation (Donald 1991). At the perceptual, motor, and nonsymbolic level of the cognitive system, automatic non-conscious processes continue to subservise both the nonlinguistic conceptual and linguistic representations. Non-domain-specific conceptual processes, including language, may be thought of as layers added to earlier evolved cognitive operations.

A transition period of language practice in social contexts continues up to the fifth or sixth year when linguistic representations and processing supplement the basic experience-based system. I have proposed a dual process theory to explain the important advances in cognitive development during the preschool years (ages 3–5) (Nelson 1996; in press; Nelson et al. 2003). Specifically, the achievement of *representational language* supplements the initial nonlinguistic experientially based conceptual system with a second linguistic representation component available to the cognitive processing system. Among other things, this enables holding in mind two competing or complementary representations at the same time (e.g., past and present states of affairs, first- and second-person perspective on the same event, etc.), with implications for performance on theory of mind tasks and category choice tasks, as well as self-reflective thought. The achievement of representational language involves the acquisition of complex semantics and syntax necessary to express propositional thoughts about things not evident in the immediate scene, such as descriptions, explanations, narratives, plans, and so on. This level of language competence, which follows several years of conversational practice with adults, particularly those concerned with the past and future, is reached by about four to five years of age.

Subsequently, domain-specific conceptual structures and associated learning and memory strategies begin to be constructed and consolidated, in collaboration with the social-cultural world that defines useful domains such as writing and arithmetic, poetry and physics, or alternatively, hunting and gathering, spinning and woodworking (see also Karmiloff-Smith 1992). Such domain-specific knowledge does not of course prevent children or normal adults from engaging in cross-domain thinking, either in science or in everyday life.

In summary, language is a cross-domain communicative and cognitive representational system made possible by a preexisting non-domain-specific conceptual system perhaps unique to human cognition. Together they compose a dual representation cognitive processing system of the extraordinary flexibility and power that we are familiar with.

Internalizing communication

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Abstract: Carruthers presents evidence concerning the cross-modular integration of information in human subjects which appears to support the “cognitive conception of language.” According to this conception, language is not just a means of communication, but also a representational medium of thought. However, Carruthers overlooks the possibility that language, in both its communicative and cognitive roles, is a nonrepresentational system of conventional signals – that words are not a medium *we think in*, but a tool *we think with*. The evidence he cites is equivocal when it comes to choosing between the cognitive conception and this radical communicative conception of language.

Reflection on our phenomenology furnishes two very different views of the role of natural language in human cognition. On the one hand, as Carruthers observes at the beginning of the target article, we are constantly running words and sentences through our heads, even when performing quite trivial cognitive tasks. This provides some support for what Carruthers terms the “cognitive conception of language,” according to which natural language constitutes a representational medium of thought. On the other hand, there is the familiar feeling that our thoughts are present in some form before we attempt to express them in natural language (“I know *what* I want to say, I just don’t know *how* to say it”). This feeling is more consistent with what Carruthers terms the “communicative conception of language,” which denies that natural language is a representational medium of thought and holds instead that its role is restricted to the communication of thoughts coded in other representational media.

Because phenomenology doesn’t settle this question, and because one of his aims is to defend the cognitive conception of language, Carruthers turns to the empirical evidence. His trump card is a series of experiments conducted by Hermer-Vazquez et al. (1999), which suggest that natural language has a crucial role in the human capacity to integrate information across different domains (in this case geometric information and information concerning object-properties). Carruthers concludes (as do Hermer-Vazquez et al.) that natural language performs this integrating function by acting as a mental *lingua franca*: a medium for representing items of information drawn from distinct domain-specific modules in the brain.

In our view, however, the situation is not so straightforward. We accept, on the basis of the experimental evidence Carruthers presents, that natural language contributes to the cross-modular integration of information in human subjects. What we question is the further claim that it does so *by acting as a representational medium* (and hence that the cited experimental work vindicates the cognitive conception of language). Carruthers does allow that language can influence cognition *without* acting as an (internal) representational medium, because it both sculpts and scaffolds cognition (sect. 2). But, as he points out, the function of language in these cases is primarily diachronic – it contributes to the *acquisition* of certain cognitive capacities rather than the real-time *exercise* of those capacities. Consequently, such processes are incapable of accounting for the synchronic integration of internally coded information, and the cognitive conception of language appears to be obligatory. However, we believe that Carruthers has overlooked a significant cognitive role for language that is both synchronic and consistent with the communicative conception – one, moreover, that has the potential to account for the cross-modular integration of information in human subjects. To demonstrate this we’ll need to consider the communicative conception of language in more detail.

What distinguishes the communicative and cognitive conceptions of language is that the former excludes natural language from among the human brain’s representational media of thought. Natural language is in the communication business, not the thinking business. Most proponents of this view accept that language enables communication precisely because it is a representational medium, but deny that it is a medium of thought. Some go further. Robert Cummins, for example, argues that written and verbal tokens of natural language communicate thoughts, not by representing them, but merely by acting as conventional “signals” that trigger appropriate representing vehicles in target brains (see especially Cummins 1996, pp. 135–40). Such signals are produced when representing vehicles in a source brain interact with motor systems via mechanisms that realize the governing conventions of language. And they influence the receiving brain by impacting on its sensory surfaces. Communication succeeds when the emitted signals cause the receiving brain to token vehicles in its representational medium of thought whose contents are sufficiently similar to those tokened in the source brain. Cummins’s insight is that linguistic signals need not (indeed *should* not) be conceived as content-bearers to explain their role in this process.

This more radical communicative conception of natural language is echoed in a recent paper by Paul Churchland, who adds an interesting twist. He claims that language is not a system for representing the world, but the “acquired skill of perceiving . . . and manipulating . . . the brain activities of your conspecifics, and of being competent, in turn, to be the subject of reciprocal brain-manipulation” (Churchland 2001). From this perspective, language is not just a means of communicating thoughts but also a way for one brain to shape the cognitive activities of another – linguistic signals fundamentally operate as a means by which we manipulate the contents and trajectory of thought in other people.

What sort of cognitive role does this leave for natural language? Clearly, sculpting and scaffolding are not ruled out, but a far more significant possibility is that the communicative process we have described also goes on *inside individual brains*. It was Vygotsky’s great insight that after children acquire a natural language as a tool for communication, they internalise it, that is, they appropriate it as a cognitive tool (Vygotsky 1962/1986). For Vygotsky, as for Carruthers, this process is one in which an external communicative scheme becomes an internalized *representational medium*. What we are suggesting, by contrast, is that the internalisation of natural language is a process whereby a conventionally governed set of communicative signals is put to work inside a single brain. Language becomes a system of signals apt not only for manipulating the brains of others, but also for recurrent *self*-manipulation. Such internalisation involves establishing communicative links (routed through the language centres) that can be employed by one part of the brain to steer the cognitive activities occurring in other parts of the brain.¹ In this picture, natural language is not an internal representational medium, it is a powerful cognitive tool – one that establishes coherent, multimodal representations, by facilitating communication within the brain, and regulates the sequencing of thought via the constant interplay between networks that encode linguistic signals and those that encode thoughts (for a fuller discussion, see O’Brien & Opie 2002).

There is emerging evidence that language, implemented primarily in temporal cortex, plays just this kind of role. Recurrent connections that loop from language centres out to the representing vehicles they trigger, and back again, catch up language and thought in a tight web of mutual influence that extends our cognitive capacities well beyond those of infraverbal organisms. Such connections may well function to integrate information across the brain’s perceptual and conceptual faculties, without recourse to a linguiform medium of thought. What we are proposing is a synchronic, fully internalized cognitive role for language that is consistent with the communicative conception. As we have put it elsewhere (O’Brien & Opie 2002), words are not a medium we *think in*, they are a tool we *think with*. The possibility of this radical communicative conception of language is one that Carruthers has failed to consider. And the empirical evidence he cites is equivocal when it comes choosing between his favoured cognitive conception and the alternative we have sketched.

NOTE

1. This idea is somewhat similar to (but not identical with) the speculations that Dennett makes about the role of natural language in organizing our thinking (see, e.g., Dennett 1991, pp. 193–99).

Speech as an opportunistic vehicle of thinking

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Abstract: Carruthers clearly identifies the basic issues involved in language and thought relations and argues for an adaptive central model. Similar conclusions were reached by classical research in the inner speech tradition. Sokolov (1968; 1972) especially emphasized that inner speech appears only when the task is difficult. The use of inner speech is not a necessity to transform representations, but it is called for when transformations become difficult. This might be related to the cognitive reorganizations leading to language as emphasized by Donald (2001).

The clear differentiation by Carruthers between two basic questions involved in the complex language and thought interface issue, namely, the involvement of language as a system and speech as an actual bodily process, on the one hand, and the mandatory or adaptive involvement of linguistic systems in thought, on the other, is a most welcome effort in the domain of cognitive science. In my commentary I shall concentrate on two issues: What can we learn in this regard from traditional experimental work on dual tasks in the inner speech research tradition, and how should one envisage the shaping of domain general or cross-domain mechanisms in the genesis of human cognition?

As Carruthers points out, cognitive science usually starts off from a communicative conception of language when dealing with the language-thought relationship. This is, according to Carruthers, Fodor’s (1983) input/output modules. There is, however, another work of Fodor (1975), the one Carruthers has in mind when he talks about the outputs of mental modules, that is, the Fodor of the language of thought, where an abstract proposition like representation is claimed to be the vehicle of any internal thought process. However, this claim is being made with no clear position regarding whether this *lingua mentis* is related to actual speech in either its genesis or its workings.

Determination in its different forms and scaffolding characterize the argumentation in the language and thought literature as Carruthers surveys it, from the conceptual analysis of philosophy through the studies on category use in cultural interactions down to laboratory research on inner speech. One can summarize and extend the different existing positions in Table 1.

Carruthers presents a rather well-argued view according to which central process modularity should be reconciled with a weakened version of linguistic determinism to the effect that language is used as a central mediator between modules, as the vehicle, if you wish, for the outputs of central processes – along the line of Fodor (1975) – which is used to compute complex trains of representations. I basically agree with this type of limited and adaptive linguistic determinism, and with the evolutionary arguments put forth in favor of it. One could enrich the evolutionary tracing by realizing how the scaffolding introduced by culture supplements or organizes the mental workings postulated by Carruthers. I have in mind specifically the position of Merlin Donald (1991; 1993; 2001) who claims that language and then writing involve feedbacks toward our own cognitive architectures (see Pléh 2002.) Donald claims, “We are a culturally bound species and live in a symbiosis with our collective creation. We seek culture, as birds seek the air. In return, culture shapes our minds, as a sculptor shapes clay” (Donald 2001, p. 300).

This is a nontrivial issue, because it touches on the way we conceive the relationships between the external social world, together with the communicative functions of language and the cognitive domain and functions. There is disagreement about this, but I do not wish to solve here, just to allude to it with another quote from Donald (2001, p. 254). “The great divide in human evolution was not language, but the formation of cognitive communities in the